Running title: risks parent-child weight talk

Can it be harmful for parents to talk to their child about their weight? A meta-analysis.

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Highlights

- Poorer wellbeing associated with parental encouragement for children to lose weight
- Parental weight criticism strongly associated with dysfunctional eating in girls
- Parental encouragement of healthy lifestyles shows no negative effects
- Interventions to promote positive parent communication benefit wellbeing
- Lack of longitudinal studies exploring causal effects of parent-child weight-talk

Abstract

Many parents express concern that raising the issue of weight risks harming their child's physical self-perceptions and wellbeing. Such concerns can deter families from engaging with weight management services. This systematic review aimed to investigate the evidence behind these concerns by analysing the association between parent-child weight-talk and child wellbeing. A systematic search of eight databases identified four intervention studies and 38 associative studies. Meta-analysis was only possible for the associative studies; to facilitate more meaningful comparisons, weight-talk was categorized into four communication types and effect size estimates for the association between these and wellbeing indicators were calculated through a random effects model. Encouraging children to lose weight and criticizing weight were associated with poorer physical self-perceptions and greater dieting and dysfunctional eating (effect sizes: 0.20 to 0.47). Conversely, parental encouragement of healthy lifestyles without explicit reference to weight was associated with better wellbeing, but this was only measured in two studies. Of the four intervention studies, only one isolated the effects of parents' communication on wellbeing outcomes, reporting a positive effect. There was no effect of age on the strength of associations, but dysfunctional eating was more strongly associated with parent communication for girls than boys. The findings indicate that some forms of parent-child weight-talk are associated with poor wellbeing, but suggest that this is not inevitable. Encouraging healthy behaviours without reference to weight-control, and positive parental involvement in acknowledging and addressing weight-concern may avoid such outcomes. More longitudinal research is needed to analyse the direction of these effects.

Introduction

Childhood obesity is a significant public health issue, associated with increased risk of disease in childhood [1] and on into adulthood [2-4]. Given its rising prevalence worldwide, initiatives to prevent and reduce childhood obesity are called for [5]. Interventions that involve parents are consistently more effective than those that do not [6]. For this reason, many countries operate child weight monitoring programmes to inform parents when a child is overweight as the first step to engaging them in preventative or reparative activities [7, 8]. However, we cannot assume that parents prioritize a child's weight in the same way as health professionals, or that they will be willing to take action to reduce their child's weight. Parents often decline offers of support for child weight management [9], or react angrily [10, 11]. One reason parents give for negative reactions to such weight-feedback is the concern that raising the issue of weight and engaging their child in weight-management activities risks harming their child's physical self-perceptions, wellbeing and could trigger eating disorders [7, 8, 10, 12-17]. That is, the negative impact of tackling weight on a child's wellbeing is perceived to be more of a threat than their being overweight.

To our knowledge there is no evidence-based information source available that either supports or disputes parents' concerns. Critics argue that without considering the potential unintended consequences of promoting parental engagement in child weight management activities, health professionals are at risk of failing to meet their obligation to 'do no harm' [18]. This paper aims to systematically review research exploring the link between parent-child weight-talk and children's wellbeing, to collate evidence to address this important issue.

There is some basis to support parents' concerns within the existing research literature; talking to a child directly about his or her weight [19, 20], teasing by family members [20], and encouraging adolescents to diet [21-26] have all been associated with unhealthy dietary behaviours (e.g., use of diet pills/laxatives, fasting, inducing vomiting). In contrast, other research suggests parental engagement may have positive effects, such as through the provision of social support [27]. As the studies on which such reports are based explore different types of communication, and report on a wide range of wellbeing outcomes, it is not immediately clear how these contrasting findings can be compared to provide an overall evaluation of the association between weight-related communication and wellbeing. Resolving this ambiguity is important for public health; while there is much to be gained from reducing childhood obesity in terms of improving lifelong physical health [28, 29], the negative impact of physical self-perceptions can also have serious health impacts. Negative physical self-perceptions have been associated with depressive symptoms [30] and dysfunctional eating behaviours [31, 32], which can impair growth and development if eating pathology emerges early in childhood [18]. Thus, if there is shown to be a risk of harm from

prompting greater parental involvement in childhood obesity, public health bodies may need to rethink their prevention activities to mitigate these risks.

More robust information on these competing risks to children's health and wellbeing from raising and addressing obesity is needed before the full picture is clear. However, a useful starting point is the systematic synthesis of the observational and intervention research currently available to identify where the gaps in our knowledge lie, and thus where new research may be most usefully targeted.

Method

Design

The research question was investigated through conducting a systematic review following guidelines from the Cochrane collaboration [33]. The protocol was registered with PROSPERO in February 2015 (CRD42015017055).

Search strategy

Eight databases were searched in March 2015 (PubMed, Web of Science, PsycInfo & PsycArticles, Embase, DARE, Scopus, Index to Theses and Biomed Central) using the search terms; (*child** OR *daughter* OR *son OR adolescent OR youth OR teen* OR young*) AND (*parent* OR *mother* OR *father OR caregiver*) AND (weight talk OR communication OR body image OR eating disorder OR dysfunctional eating OR wellbeing) AND (weight OR obes* OR overweight). No date limits were set. Following screening of titles retrieved through the search terms, 11 lead-authors of articles most closely matching the study aims were contacted through personal email to obtain further grey literature, and a request for further additional or unpublished data sent out through online networks (Research Gate, Social Policy and Practice, Linkedin). A hand-search was then conducted of the reference lists of eligible articles.

Inclusion/exclusion criteria

Studies were included if reports were available for communication between either or both parents and children of school age; studies were excluded if they reported on communication with non-parent adults, or children with clinically diagnosed eating disorders or medical conditions affecting eating, physical activity and weight (e.g., cystic fibrosis, diabetes). The focus of the systematic review was on parent-child communication about weight, rather than parenting practices related to weight-related behaviours, so studies reporting only on practices that are 'done to' a child rather than those involving discussion of weight or weight-related behaviours were excluded (e.g., feeding practices). All types of parent-child communication were included, as were all types of child wellbeing indicators, as

defined by study authors. Restrained eating and dysfunctional weight loss behaviours were included, as they are indicative of poor weight-related wellbeing when occurring at this early age. As body image concern is reported to be an issue for children of all body weights [34], and as children and parents are known to be inaccurate in correctly classifying a child's weight [35, 36], studies reporting on children of all body weights were included. Only quantitative studies were included to facilitate meta-analysis; studies reporting on observed associations were separated from intervention studies for analysis following data extraction.

Review strategy and data extraction

In line with the Cochrane guidance for systematic reviews [33], studies were screened for inclusion through three phases: Initial screening was conducted to identify studies that could be clearly excluded according to (1) study title and (2) abstract (by AL), retaining all cases of uncertainty to Step 3. (3) Full texts of all remaining articles were retrieved, and data extracted and screened against the inclusion criteria independently by two researchers using a standard template (AL and FG). The template included; date of study, region/country, aims, research setting (e.g., school, home, health care), child population characteristics (e.g., weight status, age, gender), parent characteristics (e.g., gender, weight status), study design (e.g., cross sectional, longitudinal), and detail of the child wellbeing outcome variables and parental communication variables measured. For intervention studies, programme content and setting were also recorded. Reasons for exclusion were recorded; we planned to resolve disagreements through discussion and referral to a third researcher, however none emerged.

Analysis

Data categorization: Given the expected (and actual) heterogeneity in the types of communication and wellbeing outcomes investigated, we planned to construct categories to group findings to assist in interpreting the data. Initial subsets were suggested and piloted by the two researchers conducting data extraction (AL and FG) to reflect the range of communication types reported, retaining the descriptor provided by the original study authors where possible, and expanded until all included papers could be adequately described (12 subsets; see Supplementary Table 1 for detail). The codes were then reviewed by all authors for conceptual similarities, and condensed into four thematic categories. The final decision was partially based on pragmatic considerations, as the lack of differentiation between constructs within measurement instruments meant that some constructs could not be separated (e.g., weight criticism and teasing were commonly included in a single measure).

Communication categories:

1) Encouragement to lose weight,
2) Encouragement to exercise/eat a healthy diet *without* reference to weight,
3) Weight criticism (including teasing),
4) Impersonal weight comment/discussion.

Child wellbeing outcomes were differentiated into four categories;

1) Self-perceptions (including; body satisfaction, weight concern, physical self-perceptions, thinness preoccupation)
2) General wellbeing (including; depressive symptoms, social anxiety)
3) Dieting or exercising for weight loss (including; dieting frequency, restrained eating)
4) Dysfunctional weight loss behaviours (including; fasting, disordered eating, bulimic symptoms)

Where multiple measures within each category were reported for the same study, the most commonly reported outcomes were included to facilitate more accurate comparisons as follows;

- for self-perceptions, body dissatisfaction was selected above weight concern or drive for thinness,
- for wellbeing, depression was selected above self-worth or self-esteem
- for dieting, dieting was selected above restrained eating or exercise for weight loss,
- for dysfunctional weight loss behaviours, composite measures of dysfunctional weight control behaviours (as labelled by study authors) were selected above binge eating, and binge eating above 'extreme' dysfunctional weight control behaviours.

Effect size estimation: For intervention studies, weighted effect sizes (Hedge's *d* for equal sample sizes, and *g* for unequal sample sizes) were calculated from the raw data to provide a standardized scale of effects. Due to the small number of studies retrieved and significant heterogeneity between the indicators of communication and wellbeing, the data was not pooled for quantitative analysis. Instead, in line with past publications, the findings were analysed using a qualitative, systematic, descriptive approach [37].

For associative studies (cross-sectional and prospective), correlations, beta weights, odds ratios, p values (trends for ordinal data) or F statistics were extracted from published papers, as available. These data were entered into SPSS, and transformed into weighted effect sizes; to enable computation of standard errors of r values, Fisher's z transformation was computed using standard transformations [38]. A random effects meta-analysis of the standardized effect size statistics [39] of the association between parent communication and child wellbeing was conducted separately for each communication type where numbers permitted (i.e., ≥4) [40]. To remove the disproportional effects of outliers, effect sizes greater

than 2 standard deviations beyond the mean (within each sub-group) were restricted to this upper value. Where necessary, effect sizes were reverse scored to ensure all positive values equated to *poorer* wellbeing (i.e., greater body dissatisfaction and dieting etc.). Data from prospective observational reports were pooled with cross-sectional reports as there were too few cases to analyse separately. Differences in outcomes between the sub-groups of gender and age (pre- or post-11 years, as most studies categorized in this way as a function of the demarcation between primary and secondary school) were assessed by applying an analogue of ANOVA to partition the variance between and within groups (indicated by a significant reduction in the Q statistic) [40].

Results

Following exclusion of duplicates, 11072 citations were identified from the database and supplementary sources (including 12 identified through grey literature searches). Figure 1 depicts the reasons for exclusion at each phase of screening. From the 138 titles that were downloaded for full screening, 42 met all the inclusion criteria comprising 38 associative studies, and four intervention studies.

Figure 1 about here

Description of studies

Intervention studies: Details of the interventions on which the four included papers reported are set out in Table 1. Only one study reported on an intervention for which parent-child communication was the sole focus [41], and thus provides information that clearly addresses the research question. This study was aimed at the prevention of negative body-related self-attributes in 12-14 year old girls of all body weights through providing communication training to mothers [41]. Communication training formed only a small part of the content of the remaining three interventions: In two studies the parental component accompanied an intervention delivered to children themselves [42, 43], and in two studies the communication component was embedded within a broader parental training package promoting other aspects of obesity prevention such as making environmental changes and goal setting [43, 44].

Associative studies: The 38 associative studies included between 40 and 2382 children, with the majority including children of a range of body weights (i.e., weight status was either not an inclusion criterion or was not measured) (Table 2). Five reported on prospective studies reporting the association between parent communication and wellbeing from one [45, 46], two [47] or ≥5 years later [48, 49]. Three studies were conducted solely with overweight or obese children [21, 50, 51], and one reported findings from overweight and healthy weight

Table 1: Interventions characteristics to promote parent-child weight-related communication

Authors/ title	Child characteristics	Sample size	Design[a] and Quality[b] score	Delivery	Duration	Outcome Measures
Corning et al., 2010 [41]	female Age range: 12-14 any body weight	31	Design: 1 Quality: 2	Delivered by psychologists to mothers in 4x90 minute face-to-face workshops Control group: wait list	4 weeks	Maternal Pressure to be thin Scale [53] Eating Disorders Inventory [54] Body Parts Dissatisfaction Scale (BPDS)[*]
Estabrooks et la., 2009 [43]	male and female age range 8-12 overweight	220	Design: 1 Quality: 4	Delivered by dieticians in 2x120 minute workshops to support home-study. No control group; basic print materials +/- 10 automated calls	1 week intensive workbook, supported by 2 group support sessions.	Kids' Eating Disorders Survey (KEDS) [60]
Neumark-Stzainer et al., 2010 [44]	female M age: 15.8 (SD=1.2) any body weight	356	Design: 2 Quality: 3	Parent component delivered by mail Control group: wait list	16 weeks	Unhealthy weight control behaviours [55] Binge eating [55] Body satisfaction (10-item modified Body Shape Satisfaction Scale)[56]
Nguyen et al., 2013 [42]	male and female age range13-16 overweight or obese	129	Design: 2 Quality: 5	Delivered by dieticians to parents in 7x75 minute weekly group sessions No control group; basic intervention vs intervention plus distance-support.	24 months (principle content delivered in months 1-2)	Mental Health Inventory-5 [57] Sex-specific body dissatisfaction scales [58] Harter Self Perception Profile for Adolescents [59]

Notes: [±]151 participants are reported in the study paper, but full data for calculation of effect sizes are only available for 129; [a] Design codings 1=intervention solely targeted at parents, 2=interventions with combined parent and child components; [b] quality rating scale ranged from 0-7 (higher scores represent tighter controls against risk of bias), although scores above 5 were not expected as concealment of treatment allocation to participants in this type of trial is not feasible; [c]scale/item constructed specifically for this study.

Table 2: Study characteristics of associative papers

Author/title	Year	Country	Child characteristics ± (sample size)	Types of communication studied [a]	Child Well-being indicator [b]
Agras, et al. [48] Childhood risk factors for thin body preoccupation and social pressure to be thin. ±±	2007	USA	Age 6-11 Both genders N=134	1. Commenting on eating habits Categories: 3	1. Thin body preoccupation Categories: 1
Anschutz, et al. [53] Maternal behaviors and restrained eating and body dissatisfaction in young children.	2009	Netherlands	Age 7-10 Both genders (48% male) N=501	1. Maternal encouragement to be thin Categories: 1	1.Restrained eating 2.Body dissatisfaction Categories: 1,3
Armstrong & Janicke [54] Differentiating the effects of maternal and peer encouragement to diet on child weight control attitudes and behaviors.. ±±	2012	USA	Age 8-17 Both genders (48% male) N=94	1. Perception of maternal encouragement to diet Categories: 1	1. Body dissatisfaction 2. Restrained eating Categories: 1,3
Balantekin, et al. [49] Parental encouragement of dieting promotes daughters' early dieting.	2014	USA	Age 11-15 Female N=197	1. Encouragement of dieting Categories: 1	1. (early) Dieting Categories: 3
Bang, et al. [55] The mediating effects of perceived parental teasing on relations of body mass index to depression and self-	2012	S Korea	Age 11-13 Both genders N=455	1. Perceptions of teasing scale Categories: 3	1. Self-perceptions 2. Depression Categories: 1,2

perception of physical appearance and global self-worth in children.. ‡‡					
Bauer, et al. [19] Mother-reported parental weight talk and adolescent girls' emotional health, weight control attempts, and disordered eating behaviors.	2013	USA	*M* Age 15.6 Female N=218	1.Comments about child's weight Categories: 4	1. Body dissatisfaction 2. Self-worth 3. Depression 4. Unhealthy weight control behaviours 5. Binge eating Categories: 1,2,4
Benedikt, et al. [56] Eating attitudes and weight-loss attempts in female adolescents and their mothers.. ‡‡	1998	Australia	Age 15-17 Female N=89	1. Encouragement to lose weight Categories: 1	1. Dietary restraint 2. Dysfunctional eating behaviours Categories: 3,4
Berge, et al. [26] Parent conversations about healthful eating and weight: associations with adolescent disordered eating behaviors..	2013	USA	*M* Age 14.4 Both genders Separate overweight /healthy N=2242	1. Parent conversations about healthy eating 2. Parent conversations about losing weight Categories: 1,2	1. Dieting 2. Dysfunctional weight loss behaviours 3. Binge eating Categories: 3,4
Davison & Deane [47] The consequence of encouraging girls to be active for weight loss.	2010	USA	Age 9-15 Female N=177	1. Encouragement of daughter to exercise for weight loss Categories: 1	1. Weight concern Categories: 1
Diaz-Zubieta [58] Familial, sociocultural, and individual predictors of eating-disorder	2005	USA	*M* Age 11.9 (9-15) Female N=143	1. Weight teasing 2. Parent concern with thinness Categories: 3	1. Eating disorder symptoms 2. Ineffectiveness Categories: 2,4

symptoms in late elementary and middle-school girls.					
Francis & Birch [57] Maternal influences on daughters' restrained eating behavior..	2005	USA	*M* Age 11.3 Female N=173	1. Encouragement of daughter to diet Categories: 1	1. Dietary restraint 2. Weight concern Categories: 1,3
Fulkerson, et al. [23] Weight-related attitudes and behaviors of adolescent boys and girls who are encouraged to diet by their mothers.. ++	2002	USA	*M* Age 14.6 Both genders (47% male) N=810	1. Encouragement to control weight Categories: 1	1. Weight dissatisfaction 2. Caring about controlling weight 3. Thinking about being thinner 4. Worrying about weight gain 5. Frequent self-weighing 6. Unhealthy weight control behaviours Categories: 1,4
Fulkerson, et al. [50] Correlates of psychosocial well-being among overweight adolescents: The role of the family.	2007	USA	7th to 12th grade (Age 12-18) Both genders Overweight N=1351	1. Family teasing 2. Father encourages to diet 3. Mother encourages to diet Categories: 1,3	1. Depressed mood 2. Body dissatisfaction 3. Self-esteem 4. Unhealthy weight control behaviours Categories: 1,2,4
Haines, et al. [59] Child versus parent report of parental influences on childrens weight-related attitudes and behaviors.	2008	USA	*M* Age 10.1 (1.1) Both genders (25% male) N=73	1. Comment on child's weight 2. Encouragement to lose weight Categories: 1,3	1. Weight concern 2. Body dissatisfaction 3. Dieting Categories: 1,3

Helfert & Warschburger [45] A prospective study on the impact of peer and parental pressure on body dissatisfaction in adolescent girls and boys. ‡‡	2011	Germany	Age 9-11 Both genders (35% male) N=439	1. Teasing 2. Encouragement for weight control Categories: 1,3	1. Weight concern Categories: 1
Keery, et al. [60] The impact of appearance-related teasing by family members.	2005	USA	*M* Age 12.6 Female N=372	1. Teased or made comments about being heavy Categories: 3	1. Body dissatisfaction 2. Restriction feelings 3. Eating disorder symptoms 4. Self-esteem Categories: 1,2,3,4
Lawrence [61] Racial and maternal influences on preadolescent females' eating attitudes and body image.	1999	USA	4th grade (Age 9-10) Female N=178	1. Encouragement to diet Categories: 1	1.Concern with weight 3. Body image dissatisfaction 4. Dieting 5. Eating disorder symptoms Categories: 1,3,4
Loth, et al. [62] Family Meals and Disordered Eating in Adolescents: Are the Benefits the Same for Everyone?.	2015	USA	*M* Age 14.45 Both genders N=2382	1. Parent teasing about weight 2. Parent initiated discussion about overweight Categories: 3	1. Dieting 2. Unhealthy weight control behaviours 3. Binge eating Categories: 3,4
Meesters, et al. [66] Social and family correlates of eating problems and muscle preoccupation in young adolescents.	2007	Netherlands	Age 10-16 Both genders N=405	1. Encouragement to lose weight 2. Encouragement to become more muscular Categories: 1	1. Food preoccupation and dieting 2. Exercising to become more muscular Categories: 3

Mukai [67] Mothers, peers, and perceived pressure to diet among Japanese adolescent girls. ±±	1996	Japan	Grades 7-11 (Age 12-17) Female N=827	1. Maternal perceived pressure to lose weight/be thin Categories: 1	1. Dysfunctional attitudes to eating Categories:4
Mukai, et al. [68] Eating attitudes and weight preoccupation among female high school students in Japan.	1994	Japan	High school Female N=197	1. Frequency of talking with mother about food 2. Frequency of talking to mother about dieting Categories:1	1. Dysfunctional attitudes to eating Categories:4
Mukai & McCloskey [71] Eating attitudes among Japanese and American elementary schoolgirls.	1996	Japan/ USA	Age 8-11 Female N=108	1. Talk to mother about food/dieting Categories: 4	1. Dysfunctional attitudes to eating Categories:4
Neumark-Sztainer, et al. [21] Family weight talk and dieting: how much do they matter for body dissatisfaction and disordered eating behaviors in adolescent girls?.	2010	USA	*M* Age 15.8 Female Overweight only N=356	1. Mother encourages to diet 2. Father encourages to diet 3. Parent discusses weight Categories: 1,4	1. Unhealthy weight control behaviours 2. Extreme weight control behaviours 3. Binge eating Categories:4
Nickelson, et al. [69] A modified obesity proneness model predicts adolescent weight concerns and inability to self-regulate eating. ±±	2012	USA	Grades 9-12 (Age 14-18) Both genders N=1533	1. Mother identification of overweight 2. Mother encourages to lose weight Categories: 1,3	1. Binge eating 2. Concern about weight Categories: 1,4
Olvera, et al. [51] Weight-related teasing, emotional eating, and weight control behaviors	2013	USA	*M* Age 11.1	1. Weight teasing	1. Emotional eating 2. Weight control behaviours 3. Binge eating

in Hispanic and African American girls.			Female Overweight only N=141	Categories: 3	Categories: 3,4
Ricciardelli, et al. [64] Body image and body change methods in adolescent boys - Role of parents, friends, and the media.	2000	Australia	Age 12-15 Male N=40	1. Positive weight /behavioural comments from mother 2. Weight/behavioural criticism from mother 3. Weight/behavioural criticism from father Categories: 3,4	1. Attempt to change eating habits to lose weight 2. Exercise to increase or decrease body size 3. Satisfaction with body shape Categories: 1,3
Rodgers, et al. [70] Gender Differences in Parental Influences on Adolescent Body Dissatisfaction and Disordered Eating.	2009	France	*M* Age 16 Both genders N=601	1. Negative comments on body weight and eating 2. Positive comments 3. Perceived pressure to be thin Categories: 1,3,4	1. Body dissatisfaction 2. Drive for thinness 3. Bulimic symptoms Categories: 1,4
Savage, et al. [63] Adolescent body satisfaction: the role of perceived parental encouragement for physical activity.	2009	USA	Age 15-16 Both genders N=379	1. Perceived parental encouragement for PA Categories: 2	1. Body satisfaction Categories: 1
Shomaker & Furman [46] Interpersonal influences on late adolescent girls' and boys' disordered eating.	2005	USA	Age 16-19 Both genders N=199	1. Pressure to be thin 2. Criticism Categories: 1,3	1. Body satisfaction 2. Dieting 3. Bulimic symptoms Categories: 1,3,4

Shroff & Thompson [72] The tripartite influence model of body image and eating disturbance: A replication with adolescent girls.	2006	USA	Age 10-15 Female N=391	1. Weight criticism Categories: 3	1. Body dissatisfaction 2. Drive for thinness 3. Bulimic symptoms 4. Self-esteem Categories: 1,2,4
Sinton [73] Individual and contextual influences on early adolescent girls' disordered eating.	2007	USA	Age 9 Female N=163	1. Encouragement to lose weight Categories:1	1. Weight concern 2. Depressive symptoms Categories:1,2
Smolak, et al. [74] Parental input and weight concerns among elementary school children.	1997	USA	Grades 4 & 5 (Age 9-11) Both genders N=552	1. Comments about weight Categories: 3	1. Body esteem 2. Weight loss attempts 3. Weight concern Categories: 1,3
Stanford & McCabe [75] Sociocultural influences on adolescent boys' body image and body change strategies.	2005	Australia	Grades 7 & 8 (age 12-14) Male N=362	1. Encouragement to lose weight Category: 1	Body dissatisfaction Body change strategies (dieting) Body change strategies (exercise) Categories: 1, 3
Thelen & Cormier [76] Desire to be thinner and weight control among children and their parents.	1995	USA	Age 9-10.5 Both genders N=118	1.Encouragement to control weight Categories: 1	1. Desire to be thinner 2. Dieting behaviours 3. Dysfunctional eating behaviours Categories: 1,3,4
Vincent & McCabe [77] Gender differences among adolescents in family, and peer influences on body dissatisfaction,	2000	Australia	Age 11-17 Both genders	1.Paternal negative comments 2. Maternal negative comments	1. Extreme weight loss behaviours 2. Bulimic tendencies 3. Body dissatisfaction

weight loss, and binge eating behaviors.			N=306	3. Maternal weight loss encouragement 4. Paternal weight loss encouragement Categories: 1, 3	Categories: 1,4
Wertheim [78] Relationships among adolescent girls' eating behaviors and their parents' weight-related attitudes and behaviors.	1999	Australia	Age 14-17 Female N=369	1. Encouragement to lose weight 2. Weight criticism 3. Positive comments Categories: 1,3,4	1. Dietary restraint 2. Bulimic symptoms Categories: 3,4
Wertheim, et al. [79] Parent influences in the transmission of eating and weight related values and behaviors. ±±	2002	Australia	*M* Age 12.8 Both genders (49% male) N=1206	1. Encouragement to lose weight Categories: 1	1. Drive for thinness 2. Body image 3. Bulimic symptoms Categories: 1,4
Xu, et al. [65] Body dissatisfaction, engagement in body change behaviors and sociocultural influences on body image among Chinese adolescents.	2010	China	*M* Age 14.47 (12-16) Both genders (42% male) N=517	1. Perceived pressure from parents to lose weight Categories: 1	1. Body image concern 2. Weight change strategies Categories: 1,3

Notes: [a]Category label: 1= Encouragement to lose weight, 2= Encouragement to exercise/eat a healthy diet without reference to weight, 3= Weight criticism, 4= Non-critical weight comment/discussion; [b] Category label 1= Self-perceptions 2= General well-being 3= Dieting or exercising for weight loss 4= Dysfunctional weight loss practices; ± Unless otherwise stated, children of all body weights were included; ±± more variables listed in the study, but only those with accompanying statistical measures of association are reported here

children separately [27]. Twenty-nine studies collected child-reports of parent communication (i.e., “Does your mother/father ever encourage you to eat less to lose weight?”), 13 studies collected parents’ own reports of their communication, and four studies reported both. Children from eight countries were represented (all from high income countries except for two conducted in upper middle income countries; China and Mexico [52]), although over half of studies were conducted in the USA (k=22). Ages ranged from eight to 18, with eight studies reporting data for only primary school aged children (≤11 years). Sixteen studies were single sex (15 girls only, one boys), and 10 of the 22 mixed-sex studies reported data for boys and girls separately. Thirteen studies reported on communication from mothers only, and 11 studies reported on the outcomes of both mothers and fathers reported separately. The distribution of studies between communication and outcome classifications is provided in Supplementary Table 2.

Outcomes

Intervention studies

The single study reporting on the outcome of parent training workshops indicated that girls whose mothers received training in communicating about weight reported a meaningful improvement in wellbeing and body satisfaction relative to the control group (effect sizes ranged from d= 0.16 to 0.96) and relative to their own baseline scores (range d=0.26 to 0.92). These differences persisted, and in some cases increased, at 3 month follow up. The effect sizes resulting from the three multi-component studies are also presented (Table 3), but the contribution of communication training to child wellbeing outcomes within these cannot be readily interpreted (although it was notable that wellbeing did not decrease in any study).

Associative studies

Encouragement to lose weight: Twenty-six studies explored the association between encouraging children to control their weight (incorporating perceived pressure from parents to lose weight or be thin, and encouragement for physical activity, dieting or healthy eating explicitly in order to control weight) and children’s wellbeing; 19 through child report, and 11 through parent report (Table 4). Based on child report, parental encouragement to lose weight was associated with greater incidence of dieting (ES =.38, p<.001) and dysfunctional weight loss practices (ES =.22, p<.001). There was a moderate positive association between parent encouragement to lose weight and depressive symptoms (ES=.47), although this was non-significant (only three studies reported on this outcome). Fewer studies were available using

Table 3: Outcomes of intervention trials on measures of children and adolescents' self-perception, wellbeing and dysfunctional eating.

Study	Sample size	Follow up	Outcome measure	Between group effect size±		Within group effect size±	
				Time 1*	Time 2*	Time 1*	Time 2*
Corning et al., 2010 [41]	31	Time 1: 5 weeks Time 2: 3 months	Perceived maternal pressure to be thin	-0.52	-0.59	0.81	1.32
			Body satisfaction	-0.24	-0.52	0.37	0.47
			Body parts wished smaller	-0.96	-0.69	0.92	0.85
			Body parts satisfied with	0.58	0.33*	-0.40	-0.70
			Drive for thinness	-0.16	-0.54	0.26	0.63
Estabrooks et la., 2009 [43]	220	Time 1: 6 months Time 2: 12 months	Eating Disorder Symptoms			0.19[b] 0.19[c] 0.12[d]	0.28[b] 0.08[c] 0.16[d]
Neumark-Stzainer et al., 2010 [44]	356	Time 1: 3 months Time 2: 9 months	Unhealthy weight control behaviours	-9.79	-18.19	20.42	35.21
			Binge eating	-3.28	0.65±±	16.45	16.32
			Body satisfaction	0.05	0.11	-0.19	-0.26

Nguyen et al., 2013 [42]	129	Time 1: 24 months	Mental Health inventory Body shape dissatisfaction Global self-worth	0.23[a] 0.42[a] -0.26[a]

Notes: [±] all effect sizes were in a direction indicating improved well-being (i.e., due to variation in the measures reported, the valence of effect sizes may differ), with the exception of the effect marked [±±]; *denotes differences that are also statistically significant ($p<.05$); [a] effect sizes are for both intervention groups combined as differences were only in relation to follow-up support to children, and did not directly relate to parent-child communication; for Estabrooks et al., effect sizes are presented for each intervention group separately, namely [b] workbook only (n=49), [c] workbook plus face to face contact (n=85), [d] workbook plus face to face contact plus automated calls (n=85) - no between group comparison is presented as all groups included communication skills training

Table 4: Association between encouragement to lose weight and well-being outcomes

Outcome	k	Range	Random effects model Mean ES (SE) [95% CI]	Q (df, p)
Self-perceptions				
child [b]	15	-.65 to .62[a]	.25 (.06)*** [.11, .38]	406.51 (14, p<.001)
parent	7	.04 to .52	.19 (.05) *** [.10, .28]	26.23 (6, p<.001)
Well-being				
child	3	.055 to 1.10	.47 (.32) *NS* [-.16, 1.10]	132.56 (2, p<.001)
parent	-			
Dieting				
child	11	.17 to .55	.38 (.04)*** [.30, .46]	59.68 (10, p<.001)
parent	6	.19 to .68	.47 (.07)*** [.33, .61)]	44.92 (5, p<.001)
Dysfunctional practices				
child	10	.12 to .59	.22 (.03)*** [.15, .29]	37.85 (9, p<.001)
parent	6	-.18 to .24	.07 (0.06) *NS* [-.03, .19]	26.89 (5, p<.001)

Notes: [a] only one study reported a negative association - if this value is excluded, the random effects ES from the remaining 14 studies = .31 (.05) [.20, .41]; [b] 'child' row refers to child-reported communication by the parent, and the 'parent' row refers to parent-reported types of communication; *p value for the effect size <.05, **p<.01, *** p<.001, *NS* – not significant; k = number of studies in the analysis.

parent-reported levels of encouragement, but a similar pattern of effects emerged for each wellbeing outcome.

Encouragement to exercise/eat a healthy diet without reference to weight: Only two studies reported on the encouragement of health behaviours without explicit reference to weight loss, both conducted with mid-adolescents in the USA. In the single diet-related study, parent conversations about healthy eating were unrelated to dieting and unhealthy weight control behaviours in healthy weight adolescents (odd ratios relative to no-conversation comparators =1.46 and 1.03 respectively), and associated with *less* dieting and fewer unhealthy weight control behaviours in overweight adolescents (odd ratios =0.40 and 0.35 respectively) [27]. In the single study in the physical activity domain, parental encouragement of physical activity without reference to weight control was positively associated with children's body satisfaction, albeit with a small effect-size (ES=.11, $p<.05$) [63].

Weight criticism: Thirteen studies reported on the association between weight criticism and wellbeing, including criticism of what a child is eating, and teasing. Based on child-reported variables (available for all studies), criticizing a child's weight showed a small but significant association with poorer wellbeing and more unhealthy eating behaviours (ES range 0.20 to 0.24; Table 5).

Impersonal weight comment/discussion: Seven studies reported on parent-child communication about weight that did not include criticism. Communication in this category focused either on positive reinforcement of the acceptability of a child's body size or eating habits [64, 67, 78, 80] and/or neutral or impersonal discussion of the health implications of healthy eating, dieting or body size [19, 21, 48]. Meta-analysis was not conducted due to the heterogeneity of these communication types.

Age and gender effects

Due to limited numbers within each sub-group, partitioning of effects by gender (both of the child and the parent) and age-group (children ≤ 11 years versus 12 years and older) was feasible only for parental encouragement to lose weight. There were no significant differences in the size or direction of effects for encouragement to lose weight on dieting, self-perceptions or dysfunctional weight loss behaviours according to the age of the child (Table 6).

Table 5: Association between parent criticism/teasing and children's well-being

Outcome	k	Range	Random effects model Mean ES (SE) [95% CI]	Q (df, p)
Outcomes for Criticism and teasing				
Self-perceptions				
child [a]	4	.13, .34	.22 (.06)*** [.11, .33]	11.81 (3, p=.008)
Well-being				
child	3	.16, .26	.20 (.03)*** [.14, .26]	1.45 (2, p=.48)
Dieting				
child	3	.15, .30	.22 (.06)*** [.11, .33]	8.66 (2, p=.0131)
Dysfunctional practices				
child	8	.06, .58	.24 (.07)*** [.11, .38]	73.67 (7, p<.001)

Notes: [a] No studies with parent reports without child reports were available so child outcomes for all were reported; [b] Four studies provided child-only reports, and one study provided a parent-only report. All are included in this analysis; *p value for the effect size <.05, **p<.01, *** p<.001, *NS* – not significant; k = number of studies in the analysis.

Table 6: Comparison of associations between parent encouragement to lose weight and well-being for younger vs older children

	Aged up to 11 Mean ES (SE) [95% CI]	12 and over Mean ES (SE) [95% CI]	ANOVA of between group effects (df)
Self-perceptions	.12 (.10) *NS* [-.08, .32] k=6	.33 (.08)*** [.17, .49] k=9	Q=2.58 (1, 14) p=.11
Dieting	.33 (.08)*** [.30, .51] k=3	.40 (.05)*** [.17, .49] k=8	Q=.62 (1, 10) p=.43
Dysfunctional practices	.18 (.08)* [.02, .34] k=2	.23 (.04)*** [.15, .32] k=8	Q=.33 (1, 8) p=.56

Notes: random effects value cited; * p<.05, **p<.005, ***p<.001; only child reported outcomes are included, and associations for which sufficient data is available computed

The association between encouragement to lose weight and weight criticism appeared to have a similar effect on self-perceptions and dieting in both genders, however when split by gender there was no significant association with dysfunctional eating for boys, but a significant moderate effect size for girls (ES=.38 and .40 for encouragement and criticism respectively) (Table 7). There was no evidence of a difference in associations according to parent gender (Supplementary Table 3).

Only four studies were available for the calculation of the size of effects for overweight children [21, 27, 50, 51]. Combined effect sizes were calculated, but are presented here as provisional estimates due to the small number of studies within each category. Overall, the direction of effects were similar to the general sample, albeit of smaller size. Both encouragement to lose weight and weight criticism were associated with poorer physical self-perceptions (d=0.09 (p<.05), and d=0.15 (p<.05) respectively) and greater dysfunctional eating (d=.12 (p<.05), and d=0.09 (p<.05) respectively).

Table 7: Comparison of associations between parent communication and well-being for boys versus girls

	Boys Mean ES (SE) [95% CI]	Girls Mean ES (SE) [95% CI]	ANOVA of between group effects (df)
Associations with encouragement to diet/lose weight			
Self-perceptions	.30 (.06) [.26, .35]*** k=20	.23 (.05) [.08, .37]*** k=22	Q=.84 (1, 41) p=.36
Dieting	.29 (.05) [.18, .40]*** k=16	.32 (.05) [.25, .38]*** k=15	Q=.10 (1, 30) p=.76
Dysfunctional practices	.09 (.06) [-.05, .22] *NS* k=9	.38 (.06) [.30, .47]*** k=9	Q=13.88 (1, 17) p<.001
Associations with criticism/teasing			
Self-perceptions	.30 (.04) [.22, .39]*** k=13	.33 (.05) [.25, .42]*** k=10	Q=.21 (1, 22) p=.65
Dysfunctional practices	-.05 (.04) [-.15, .05] *NS* k=5	.40 (.03) [.36, .44]*** k=9	Q=91.60 (1, 13) p<.001

Notes: random effects value cited, * p<.05, **p<.005, ***p<.001; only child reported outcomes are included, and associations for which sufficient data is available computed

Discussion

A systematic literature review resulted in 38 studies reporting on the association between parents' weight-related communication and indicators of children's wellbeing suitable for meta-analysis, but only four reporting on the outcomes of communication interventions on children's wellbeing. Despite the common search process, the focus of two sets of studies emerged to be very different; the intervention studies reflected a conscious attempt to encourage and train parents to use positive forms of communication with the explicit aim of improving children's physical self-perceptions and wellbeing, whereas the associative studies reported on observations of habitual communication whether intended supportively or critically. There was limited overlap between the communication types measured in the associative studies and

those forming the basis for intervention (i.e., supportive conversations focusing on changing behaviour to promote positive wellbeing and self-perceptions rather than for weight control). Thus, the associative and intervention studies each answer a different aspect of the research question and will be discussed separately.

The meta-analysis of associative studies indicated that children's perceptions of being encouraged to lose weight (including dieting or exercising explicitly for weight control) or being teased or criticized about their weight were both associated with poorer physical self-perceptions and greater engagement in dieting and dysfunctional eating. Thus, this main finding appears to confirm the perceptions of parents that stimulated this research [10, 11, 81]. However, these negative effects were not inevitable; the two studies reporting on parent-child conversations around improving diet and exercise without explicitly referring to weight control indicated that not only may this approach avoid harm, but for overweight adolescents in particular, this type of communication is associated with improved wellbeing.

Only one intervention study was found that reported on the independent contribution of parent-child communication to wellbeing, without targeting additional parenting practices [41]. This study supported the finding from the meta-analysis that talking sensitively to children about their weight and encouraging them to improve their health behaviours need not be harmful. Instead, a brief training intervention appeared to be beneficial to wellbeing. The three other studies that incorporated parent-communication training identified by the review did not isolate the effects of communication form other intervention elements, but nonetheless are consistent with this finding as none showed any detriment to children's wellbeing as a result of parent-communication training. The positive outcomes of encouraging healthy behaviours without reference to weight loss may be no surprise to practitioners, as it is already common practice within public health and behavioural interventions [82], and fits with parents' intuitive preference to avoid letting their child know that they are overweight [10]. However, the lack of evidence to support this intuitive approach limits our ability to provide this advice to parents within an evidence-based public health service.

Putting these findings into perspective, parent-child communication about weight takes place against the back drop of the wider parent-child relationship and family environment, and (due to the highly visible nature of weight) in parallel to other influences such as interactions with peers, teachers, the media and wider community. As such, it is unlikely that single communication techniques, as considered separately here, are sufficient to bring about distinct effects on wellbeing. In particular, general parenting style is consistently linked to childhood obesity by

moderating the impact of parents' specific conversations and practices related to children's food, physical activity and sedentary behaviour. This moderating effect is evident on both a child's diet quality [83-85] and physical activity levels [86]. While such complex interactions between different influences on children have been modelled [87], it is still useful to identify the impact of specific practices (such as weight-talk) within such systems as these individual practices may be more open to change and more acceptable to raise with parents than their general parenting style. That is, isolating specific practices that we can advise parents to use or avoid when initiating lifestyle changes for weight control with their children may provide an acceptable and achievable first step along the road to more holistic changes to parenting style.

Implications

Children in many countries experience situations in which their weight is assessed by others, whether through formal processes such as measurement by health professionals through national monitoring schemes (e.g., the UK National Child Measurement Programme [88], most European countries [89] and US BMI report card scheme [90]), or informally, for example through the comments made by peers and teachers [91]. National weight monitoring schemes in particular have been criticized for putting children at risk of harm with respect to their body image and wellbeing through triggering criticism of their weight from parents [18, 92], particularly as there is little evidence to show that such schemes are effective in reducing obesity prevalence [92, 93]. That is, where previously parents could choose not to raise the topic at all, as the child is aware of the measurement taking place, national weight monitoring schemes may force parents to discuss weight with their children even if they feel unprepared or unwilling to do so. Therefore, it seems appropriate to investigate ways to support parents to have these conversations in a positive way.

Strengths and Limitations

This review is the first attempt to bring together the research surrounding the association between parent-child weight-talk and children's wellbeing. It thus provides a summary of research to date to identify gaps in the evidence base, and contributes to academic debate [18, 92] regarding the rights and risks of childhood obesity policy [10, 11]. Further, it puts an under-researched area of public concern onto researchers' agenda; a public concern evidenced in the UK by the high-profile media coverage of parents' criticism of national monitoring of children's weight (including; BBC news, The Telegraph, Sky News, November 2015 [94, 95]). The consistency of the results reported in this meta-analysis - despite the heterogeneity of studies

and indicators included - lends support to the reliability of the findings. Further, this review indicates that the associations between parent-child communication and wellbeing are similar whether we use parent or child reports of the communication that takes place, providing useful information for the interpretation and conduct of research in this area.

There are also limitations to this work; while the five prospective studies included within our review suggest that it is reasonable to expect the implied direction of effect in which parent communication influences children's wellbeing, the conclusions of this study are limited by the inclusion of predominantly cross sectional data which cannot be used to infer cause and effect. It is possible that parents initiate conversations about weight in response to observing children's poor wellbeing rather than the other way around, or that both factors are influenced by some other common variable (e.g., a child's objective weight, the wider family environment, etc.). Further, we cannot isolate the impact of parent-child communication from other influences that may co-occur (e.g., teasing by peers, siblings, etc.), and it may be artificial to rigidly separate different types of parent communication which may also normally occur together (e.g., encouragement to eat more healthily may explicitly or implicitly accompany criticism of a child's weight as parents' explain their rationale). The meta-analysis is also limited by the lack of differentiation within studies between healthy and overweight children, preventing consideration of whether objective weight statues moderates reported effects. However, as children of all body weights report body image concern [34, 96], and concerns regarding discussing weight are not restricted to parents of overweight children [12, 17], the present research question is certainly still relevant to all families. Finally, the strength of our conclusions is limited by the number of studies in two crucial categories; only two studies reported on the association between discussing healthy lifestyles without reference to weight control and wellbeing, and only one intervention trial reported on the independent effects of improved communication style.

Conclusions

Cross-sectional studies indicate that parental encouragement to lose weight has a similar negative association with child wellbeing and risks of unhealthy eating behaviours as does parental teasing or criticism of a child about their weight. These associations are observed in children of all ages, and are more likely to be associated with dysfunctional eating behaviours in girls than boys. Provisional evidence suggests that encouraging healthy eating and physical activity without reference to weight loss is not associated with these negative effects, however, more longitudinal research is needed to explore the causal nature of these associations, and

provide a firm foundation for advice given to parents within evidence-based public health practice.

Conflicts of Interest: None to declare

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